THE
VETERINARY JOURNAL

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JUNE, 1927.

Obituary

PROFESSOR JOHN PENBERTHY, J.P., F.R.C.V.S.

THE death of Professor Penberthy has removed a link in the professional chain of a large number of students and practitioners, as his name has been prominently connected with the profession for the last 45 years.

After graduating at the London College in 1881, his choice of career at that time wavered between the army, for which he actually passed the examination, and an appointment in civil life. An inclination for the latter prevailed and he accepted the position of House Surgeon in the College, speedily becoming one of its best-known teachers and professors. At the time of his retirement from collegiate life, he held the post of Professor of Medicine ; and in the veterinary political sphere, he was a Member of the Council of the Royal College of Veterinary Surgeons from 1880 to 1902, being elected President in 1897. After retiring from active life, he was elected to the Examinership in Medicine and Meat Inspection, in which capacity he officiated until his death.

Of his other spheres of activity it is to be noted he was for many years interested as an active member of the Council of the National Veterinary Medical Association, serving this body as Honorary Secretary, and also contributing papers on various occasions.

In his own district he gave up a good deal of time to local public work, being appointed a magistrate for the County of Gloucester in 1901 and elected Chairman of the Parish Council of Newnham, being also a member of the Standing Committee for the control of sundry rural affairs, and taking an active part in the working of many agricultural entities. At the actual time of his death he was officially working as the Veterinary Inspector to the Bath and West of England Show. During the late European War he was on active service at home, and was gazetted out with the rank of major. The sympathy of the profession will be extended to his bereaved wife and daughter.

Editorials

"ACCREDITED HERDS" TUBERCULOSIS AND CONTAGIOUS ABORTION.

WITH the whole-hearted assistance of the Veterinary Profession, the United States of America are waging war on Tuberculosis on a grand scale. The figures are stupendous. "Over 13,000,000 head of cattle are under the supervision and the provisions of the accredited-herd and area-eradication plans. Over 3,500,000 more are on the waiting list. Since there are 65,000,000 head of cattle in the United States, it may be seen that tuberculosis associates have been, or are being, removed from about 20 per cent. of the cattle of this country. This work has sustained the reliability of the tuberculin test and the efficacy of slaughter of infected animals and disinfection of premises, in spite of powerful critical agitation."—(Schilling.) A commencement is also being made towards the State control of infectious abortion of cattle.

In the December issue of the Journal of the American Veterinary Medical Association, there is a report of two papers submitted to the 63rd annual meeting of the American Veterinary Medical Association, held at Lexington, Kentucky, in August last. The first is on the "Efforts to Prevent the Spread of Infectious Abortion by Application of Sero-logical Tests to Importations of Breeding and Dairy Animals," presented by J. H. Bux, State Veterinarian, who tells of "the promulgation of a regulation requiring the application of the agglutination or complement-fixation test to all breeding and dairy cattle in excess of six months of age, by Georgia, in January, 1924, followed later by South Carolina" and more recently in Arkansas. He states, however, that "the highest results in the application of the test will not be attained without some standardisation of the technic." According to the report of the Committee on Bovine Infectious Abortion of the United States Live Stock Sanitary Association, the following resolution was unanimously adopted by the Association in December, 1925: "We desire to emphasise that the sera reactions for bovine infectious abortion are reliable. True they do have certain weaknesses, but that can be said about any biological test. The greater extent to which they are being used by practitioners, as pointed out by your Committee last year, is an indication of their worth, and also the breeders appreciate their value and are requesting that their herds be tested. That the live stock sanitary authorities of each state study the situation in respect of this disease in their particular commonwealths, and initiate such control measures as they consider

advisable, and further, that such authorities be prepared to report to this Association next year the progress which has been made."

In the second paper on "Abortion Vaccine an Important Factor in the Economic Control of Abortion Disease," G. E. Corwin urged the use of vaccine for preventive purposes on the grounds that "it is better to introduce immunising agents and hasten immunity, than to allow a natural infection to take place, thereby doing away with the sequels." In the discussion which followed, Dr. Cotton, a well known authority, while criticising Dr. Corwin's conclusions, stated, "The Committee on Abortion Disease of this Association, as well as that of the U.S. Live Stock Sanitary Association, for a number of years, did not offer or present to us anything pertaining to the control that was of practical value, until about three years ago. Since that time they have presented practical methods and we now know that, by the use of the blood tests, which are constantly becoming more standardised, the animals affected with this disease can be removed from a herd and, by practising the necessary methods of isolation and disinfection, the disease can not only be limited, but can be eliminated." It would, therefore, appear that the control of infectious bovine abortion which is as serious a menace to the progress of the pastoral industry in Great Britain as it is in the United States of America, must depend upon three principles:—

1.—The detection of the disease by some simple and standardised test, possibly based upon the agglutination method.

2.—Prophylactic measures based upon the information so obtained.

3.—A reliable method of preventive inoculation for the protection of animals in danger of infection.

With regard to item No. 1. It has to be admitted that the deductions drawn from the agglutination test are somewhat indefinite. A positive result does not indicate whether a reactor has aborted, is about to abort, or having aborted has become a carrier. Nevertheless, in practice, a positive result does indicate beyond doubt that the animal is, has been, or may become a source of infection, and as such should be excluded from the herd.

Again, prophylactic measures based upon such a result must necessarily be largely based upon circumstances, and must be applied, let us say, "secundum artem." In this respect the judgment and wisdom of the veterinarian in charge of the outbreak is a factor of the utmost importance. A general practitioner whose object is the elimination of the disease from the herd, will undoubtedly devise ways and means whereby the disease will not only be eradicated from

the herd under his charge, but will take equal care that it is not re-introduced from without.

Lastly, having removed reactors, he will realise that until his efforts have finally removed all sources of infection he must protect all animals in danger of contracting the disease. In his efforts to avoid this contingency he will seek to set up by artificial means, some degree of immunity, possibly by means of vaccination. He will have to decide upon the relative usefulness of the " live " and " dead " vaccines. He will have to make up his mind whether the risk attached to the former which if unwisely applied may actually set up a new focus of infection, or, as some assert, may give rise to sterility, is not better than to apply a " dead " vaccine which, while doing no harm, may do no good. This phase of the problem is of such grave importance that we venture to suggest that a series of experiments should be conducted without bias, by our veterinary research officers, with a view to, once and for all, settling this vexed question.

We believe that to-day we are nearer the solution of these problems than we have been. It may be that in the " Abortoscope," concerning which we have written from time to time, and the usefulness and accuracy of which has been vouched for by more than one of our leading clinicians, may provide the practical standardised test required for the detection of this disease, and in one or more of the non-virulent vaccines we may find the protective inoculation which can be applied to pregnant and non-pregnant animals alike. But the state veterinary system has a long way to travel before it can institute a campaign upon the same scale as that adopted in the United States. Indeed, the whole problem rests and must rest for a long time upon the unaided efforts of the veterinary profession. If, acting alone and unaided, our profession succeeds in getting the better of this disease, it will have added another achievement to the very long, if unrecognised, list of benefits it has already conferred upon the pastoral industry of this country.

ROYAL VETERINARY COLLEGE REBUILDING FUND.

With a view to helping matters forward in regard to the rebuilding of the Royal Veterinary College, London, we have opened up our columns in support of the appeal which has been issued, and we shall be glad to receive and forward any sums which may be directed to us.

Enclosed with this month's issue is the first list, which our readers will note, already amounts to the sum of £333 - 3 - 6.

We trust that practitioners who have kindly undertaken Collecting Cards will miss no opportunity of getting the signatures of their

clients appended thereon; as, even if the sum subscribed is only a small one, it displays an interest in the cause which cannot tail to have a good moral effect.

General Articles

THE LONDON MILK SUPPLY.

By MAJOR A. DUFF DUNBAR, M.R.C.V.S.,
Public Health Dept., County Hall, Westminster, S.E.

Six years ago, I submitted to the London Section of the "National" data of facts bearing on the London milk supply from a pure milk aspect, and was so far hopeful that these, might be of some practical assistance to those immediately interested or connected in the "hunt" for the cow giving milk containing the bacilli tuberculosis, and have referred to the subject more than once since, with what result? One is, therefore, exceedingly diffident to again invade! On that occasion I had the temerity to make the bald statement that all milk ought to be free from the invasion of T.B. within 18 months of the inception of any Act or Order (as we now have) relative to a pure and clean milk, but I have to admit I "reckoned without my host"; still, I maintain I fail to see any reason why that cannot be accomplished.

By comparisons are deductions moulded. The L.C.C., some 20 years ago, acquired powers to improve the conditions of London milk supply. Advantage was immediately taken of these powers, and a system of taking samples of country milk at the various railway termini was established, and still continues. During the first few years the percentage of tubercular infected milk was *very high*, as was also the bacterial count, but after many thousands of cows, giving milk containing the T.B. were relegated to their proper sphere, the milk became a comparatively pure milk and continued so until the last few months, when the "positive" results have gone up by "leaps and bounds," higher than we have experienced for very many years, *and in one week recently out of 48 samples taken 27 contained tubercle bacilli*. One is hopeful that it is only temporary, but there must be a reason and a cause. Throughout those years one could not but be impressed by the gradual improvement in the type of animal, sanitary conditions, provision for cleanliness and so on (in ratio to the acumen of the owners), resulting from, may one say, helpful conversations, which unbiasedly relieves the farmer or milk producer, as they soon found that a tubercular animal was of no use for their purpose. They welcomed the examination of their herds, and an early diagnosis,

so that the animals could be prepared for slaughter and possibly get a fair return, taking the risk of diseased parts being retained by meat inspectors. The meagre compensation now allowed does not encourage "reporting," but the emaciated animal is not here under consideration.

A "note of warning was sounded" some months since, when distinct retrogression was evidenced, with little or no effect. Many thousands of churns of milk arrive in London daily from all parts of the country, and one may be pardoned for stating that a fairly accurate conception of what obtains throughout the country generally, and "first hand," which leads one to think things; "but were I Brutus, and Brutus Antony, there were an Antony——"

The owner, therefore, being absolved from knowlingly harbouring a tubercular cow, one may consider the other two factors, viz., the county or district authorities, and the veterinary officer. Does the former give the latter a proper status and powers, and does the latter exercise powers allocated to him to the best advantage?

One assumes that the onus on an authority should be that all milk-giving cows in their area ought to be examined quarterly, or as an alternative a "bulk" sample taken at frequent intervals from each herd, properly tested or examined, and action taken where necessary, which one cannot avoid from thinking does not lend or encourage the inspector to give of his best.

A tirade on diagnosis is out with the scope of this note, but a perfunctory examination is not remedial in any way. One concludes that many of us now know that there are *no* external signs to assist in arriving at a conclusion, and that it is only by careful clinical procedure that the culprits can be detected. The various tests, condition and appearances of glands and so on, are of no assistance, but these must be well known now also.

Possibly one was over hopeful and expected, at least, a slight improvement as the results of the past 18 months' work, but in place of portraying a roseate picture, Ichabod is pertinent.

There is not an iota of evidence that tubercular disease is on the increase—in fact, the contrary,—*but there are indications that milk containing the bacilli is not being lessened*, and from no recondite cause—that is the crux. The panacea for impure milk is not to be found in elaborate mechanical apparatus, after the fact, but by the careful work of the veterinary surgeon at the source.

THE CONTROL AND ERADICATION OF SWINE FEVER.

By H. B. ELLIOT, M.R.C.V.S.,
Hilo, Hawaii.

By a coincidence, the February number of this journal, containing an article by Mr. W. Wallace Kerr, advocating the introduction into

Great Britain of the sero-simultaneous method of immunisation against swine fever, came to hand just at the moment when I was finishing an article for submission to another veterinary periodical condemning this procedure, and advising its discontinuance in the United States. The following statement comprises a brief and condensed digest of the reasons which govern my objection to this policy.

At this stage in our knowledge of the factors that link disease transmissions we should realise, and continuously keep in mind, the fact that sanitation is more than a first line of defence; it is, and always must be our paramount and safest protection against contagious diseases. We must, also, clearly understand that any use of immunisation practice that weakens this defence is fraught with potential danger; and that the discovery and development of any immunising agent can only be beneficial to mankind if the right use is made of it.

In veterinary preventive medicine we have the advantage over the medical profession in our ability to apply much more drastic methods of control by slaughter of diseased and in-contact animals, and by prolonged quarantines and movement restrictions; and all of our experience proves that, in the long run, these are our best and most economical checks on the swiftly spreading epidemics. In our campaigns immunisation may be a most valuable *adjunct*, but it must not be considered to be more than this.

The failure of the British campaign of eradication of swine fever in the 'nineties has powerfully influenced our ideas of this disease ever since. It perpetuated exaggerated suppositions of mysterious transmission and persistence of infection which are still generally and mistakenly held by the majority of the members of our profession. Possibly divided authority and lax enforcement had much to do with this failure, but there is now good reason to suspect that the missing factor was absence of control over garbage, or swill, feeding. *Those who do not regulate and restrict garbage collection and feeding cannot hope to control swine fever.*

The turning point in the policy of control in the United States hinged on the appearance of the Dorset-Niles, or sero-simultaneous, method of immunisation about twenty years ago. The history of control in that country since then is a striking example of the potential dangers in immunisation reliance. Almost inevitably the balance was quickly shifted from the enforcement of strict and energetic sanitary control to the easier method of throwing the responsibility upon the hog owner by suggesting that he should provide his own protection.

The basis of the American system is *voluntary* immunisation. This is not, and cannot be, an effective check against diseases of this type because it is in every respect, psychological and otherwise, contrary to our knowledge of human nature. Just think for one moment of voluntary vaccination as a preventive measure to check human smallpox, and visualise what the results would be. If, when Mr. Kerr wrote his paper, he had known the full details of the disastrous endemic of swine fever in the United States during the late summer and autumn, he would probably have been slower in advancing his recommendation. Now, this disaster is bound to be a recurrent phenomenon under continuance of present policies, and any competent biological mathematician can calculate with reasonable accuracy the apices of future similar catastrophies in future years. Surely Mr. Kerr will admit that any policy that contains this certainty of periodical disaster cannot be considered to be sufficiently safe and reliable for introduction into Great Britain.

So far as the other dangers attending this permanent immunisation are concerned, I am simply going to say that the possibility of starting new centres of infection cannot be denied by its most enthusiastic proponent, and that it is very difficult to avoid abuse at the hands of unqualified persons. It must be remembered, also, that the annual expense of nation-wide immunisation is very great, and that it is much cheaper to try to create a situation in which this immunisation is not necessary.

No real progress in the control of this disease can be made until we discard the mistaken belief that swine fever in its transmission and persistence of infection is enveloped in a fog of impenetrable mystery. There is an increasing volume of evidence that this is not the case: that the live hog and the carcase of the diseased hog are the principal links in transmission; and that, under proper precautions, persistence of infection in contaminated premises is very unusual. When this view is once accepted it is impossible to escape the conviction that swine fever is an eradicable disease, and this conviction supplies the elements of hope and confidence that are indispensable in any successful effort.

Everybody knows that the live hog exposed to contact with diseased animals is a dangerous disseminator of infection from one place to another. *The idea that the carcase of a diseased animal may be still more dangerous is more slowly gaining acceptance.* Atherton, of Maryland, asserts that 80 per cent. of the outbreaks in that state are caused by garbage infection! That may seem to be an extraordinary assertion, but it is very probable that much more careful investigation into causes of outbreaks in all countries would multiply this evidence

to an unbelievable extent. That such infections may appear at long distances from the original source is confirmed by the experiences of the Canadian authorities, of Onissimenko, in Manchuria, and of myself in Hawaii.

The other bugaboo that induces lethargy and indifference is the delusion that swine fever infection is very persistent, and exceedingly difficult to exorcise from contaminated premises. This has not been the experience of the inspectors of the Dominion government in the working of their admirable system of control, and my own observations, under much more unfavourable conditions, confirm this view; and, also, the opinion that recurrence is usually due to fresh infection. I am very positive in the belief that this feature of persistence has been unduly exaggerated, and that it should not be regarded as a serious obstacle in a campaign aiming at eradication.

It is surprising that the Canadian plan of control has attracted so little attention outside of that country. I noticed a review in this Journal of the official report for the year 1925 which completely overlooked the most important and significant item, namely, the success of their swine fever policy. The following description of this plan is given for the benefit of those who are unacquainted with its details.

All hogs imported from the United States are subject to a thirty-day quarantine, and even importation for immediate slaughter is forbidden.

The manufacture, importation, sale, and use of hog cholera virus is prohibited. They do not use virus under any circumstances, but do use serum for checking outbreaks.

It was observed that outbreaks were most common in garbage-fed hogs, and the discovery was made that many of these outbreaks were associated with feeding of imported pork products. It was then decided to prohibit the feeding of garbage to hogs on any premises other than those upon which it was produced, *except under special licence.* Before such a licence can be obtained the individual must provide suitable facilities for the *thorough cooking* of the garbage, and must be in a position to maintain his premises in a satisfactory state.

All infected hogs on premises are slaughtered, and the carcases burned or deeply buried. Hogs with normal temperatures on the same premises *are immunised with serum by the inspectors,* and quarantined until fit for slaughter. The premises are cleaned and disinfected; and when the hogs are ready for the butcher a licence is issued for their removal. After all hogs have been removed the

premises are again disinfected, and no introduction of fresh hogs is allowed for a period of three months.

All hogs on surrounding premises are quarantined and *serum treated*. The owners are advised to fatten as many as possible for the block, and all others are quarantined for a sufficient length of time to ensure safety.

Compensation is paid for condemned hogs excepting where there is proof of feeding insufficiently cooked garbage or contravention of garbage regulations.

This is sound and sensible practice, and one to which every experienced sanitarian can give unqualified approval. It is the right method of handling swine fever, and the statistics of the Dominion government illustrate its success :—

	Compensation Payments.	No. of Animals Slaughtered.
1914-15	$196,981·00	34,779
1925-26	10,666·66	980

I was curious to learn how Canada fared during the period last year, which was so destructive in the United States, and am informed that from April 1st, 1926, to January 22nd of this year compensation amounting to $5,463·66 was paid out for 271 animals ! This marked difference in results is not due to differing environments : it is due to difference in method.

It seems strange that at this late date it should be necessary to supply evidence in proof of the efficacy of serum immunity in swine fever. Serum immunisation should be regarded in the light of an adjunct to good sanitary control, but as such an adjunct it is almost invaluable, and the efficiency of any campaign is tremendously enhanced by *compulsory* immunisation of all swine on the premises and in the immediate neighbourhood. So far as price is concerned, I may add that last year our average cost of clear concentrated serum landed on this island was about five shillings per hundred cubic centimetres. To fully cover all losses it was distributed at an extra charge of one shilling for the same amount. The price in the United States is subject to fluctuation throughout the year, but British authorities purchasing in large quantities ought to be able on the average to better these figures. I hesitate to advance an opinion upon this point, but I am inclined to think that in the end it will probably be cheaper to buy this product from the American commercial laboratories than to establish a serum factory in Great Britain. The serum is subjected to careful tests by government inspectors, and is generally considered to be very reliable.

The small number of swine in Great Britain in comparison with the size of the human population, and the very large importation of

pork products, suggest that a profitable field of national enterprise is being neglected. Elimination of the swine fever menace would undoubtedly be a powerful stimulant to this development, and every possible effort should be made to do away with this deadly and most expensive nuisance. But it must be remembered that eternal vigilance is the price that must be paid for safety. Always there will remain the danger of recurrence from foreign sources through the medium of imported pork products containing infection, and this one fact will always compel strict and careful enforcement of necessary precautions.

THE CLEAN MILK SUPPLY OF READING.

By W. A. HOY,
The National Institute for Research in Dairying, University of Reading.

THE term "clean" in connection with milk is just now very much in the public eye.

For instance, it has largely superseded the familiar term "pure new milk" on tradesmen's carts, barrows and bottle caps. In too many cases the term means nothing, and its use in this way may confuse the public who will come to regard it merely as a catch word for advertisement purposes.

Among a section of the public, and many producers and retailers, the term clean milk has, however, acquired a very definite meaning, and to them it signifies not milk which has been artificially freed from its initial contamination, but milk which has always been clean in the best sense of the word, that is to say, clean milk is milk which has never been allowed to become contaminated either with visible dirt or extraneous organisms.

The clean milk with which this article deals is "Grade A Tuberculin Tested," which is, of course, produced and retailed under licence.

Before a farmer can qualify for such a licence he must conform to certain specific regulations which at present do not apply to the ordinary producer of milk. In the first place his cows must all have passed the Tuberculin Test applied by a qualified veterinary surgeon, and they must remain under official supervision, which guarantees their freedom from other diseases which may affect the milk.

Secondly, the producer must supply evidence that he is able to produce milk of a low bacterial content and the results of the examinations of two samples of milk of different milkings must be forwarded to the Ministry of Health, together with the results of the tuberculin tests before a farm inspection is attempted.

The cowhouses, dairy buildings and methods at the farm are subject to inspection on the score card system.

XUM

Before attempting to obtain a licence it is usual for an intending producer of "Grade A Tuberculin Tested Milk" to get in touch with the local Agricultural Education Authority or a similar body, and to obtain all the necessary information before embarking upon any alteration of buildings, etc. The farmer must exercise great care and cleanliness at all points in the production of milk, and his milk must at all times conform to a definite bacteriological standard. This involves the closest attention to details which are epitomised below :—

(1) The long hair on and around the udder is kept clipped to make cleansing easier and to avoid the accumulation of dirt.

(2) Before each milking the udder and its immediate surroundings are washed clean.

FIG. I.—Grade A T.T. Milk as delivered to the retailer, showing sealed and ventilated 10-gallon churns with label bearing the designation of milk. Back of label contains particulars of production and name of producer.

(3) The milker's hands are washed between the milking of each cow. A clean milking suit is worn and a scrubbed stool is used.

(4) The fore milk from each quarter is rejected and the milk taken into a sterilized small topped covered milking pail.

(5) The milk is strained and cooled immediately.

(6) It is dispatched from the farm in sterile sealed 10-gallon churns which must be conspicuously marked "Grade A Tuberculin Tested," with the time of production.

(7) After milking, all utensils are washed clean and then sterilized by steam. (This is a highly important operation and influences more than any other single factor the bacteriological count of the milk.)

This milk can only be retailed by distributors who are specially licensed for the purpose by the local health authority, which is

responsible for the subsequent control of the milk. It is handled apart from all other milk and must be distributed in sterile bottles which bear the date of production and the name of the seller. This means that this milk has a definite known history and *can be easily traced to its source.*

GRADE A TUBERCULIN TESTED MILK IN READING.

About one-sixth of the milk supply of Reading, which is a town of about 100,000 people is " Grade A Tuberculin Tested " and it is of interest to note that no other graded milk, raw or pasteurized, is sold in the town. " Certified " milk was handled by two retailers for some time, but competition from " Grade A Tuberculin Tested " milk soon caused its disappearance from the market as the public did not appreciate the differences between " Certified " and " Grade A

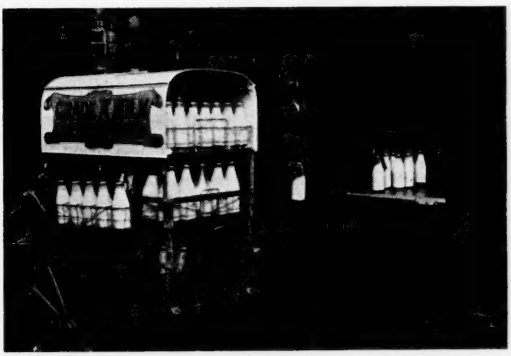

FIG II.—Grade A T.T. Milk as delivered to consumer in sealed sterile bottles.

Tuberculin Tested." Until quite recently the distribution of " Grade A Tuberculin Tested " milk remained in the hands of a few of the larger retailers, who still distribute the greater part of the total quantity. Owing, however, to the demands of their customers, many smaller retailers have been obliged to take out licences to sell this milk, which can now be obtained from no less than 20 different shops in Reading. The retailers draw their supplies both by rail and by road from farms within easy distance of the town.

Those distributors who cannot take the whole of a farmer's output are supplied with level quantities from a central depot. In some instances the milk is supplied to them in sealed bottles. This latter procedure tends not only to centralise the actual handling of the bulk, but provides for these small retailers who cannot operate on a big scale and whose premises are not suitable for bottling.

XUM

How the Milk is Absorbed.—The destination of "Grade A Tuberculin Tested Milk" in Reading is interesting. Of the total quantity of "Grade A Tuberculin Tested" milk sold, 60 per cent. is bought by private consumers of whom half belong to the working class. The remainder (40 per cent.) is taken by hospitals, welfare and other institutions.

Control.—All the distributors are under the control of the local health authority. Samples of the milk as delivered to the consumer are taken at irregular intervals and submitted to a laboratory for bacteriological examination. This includes the estimation of the total number of bacteria per 1 c.c. and of bacillus coli, which latter organism is used as an index of the quality of the work done.

In practice there is no other satisfactory method of controlling milk which is subject to a bacteriological standard, and it has proved to be entirely satisfactory.

Since the bacterial count is affected by age and temperatures conformation to the test means that the methods of distribution have been satisfactory and that the milk is really of the age stated.

The close proximity of the National Institute for Research in Dairying to Reading has afforded an excellent opportunity of studying the possibilities of a clean raw milk supply and of demonstrating its entire feasibility. The table shows that provided the milk reaches the retailer in a satisfactory condition he can bottle it, and pass it on to the consumer in almost the same bacteriological condition as he received it. Of 93 churn samples taken in the course of the year only one failed to conform to the standard. When this milk was bottled it was found that on only one occasion was the retailer responsible for any significant addition to the bacteriological content of the milk.

Price.—Price is, of course, a highly important matter, and it must be realised that under the existing conditions of milk production the extra costs involved in the production of "Grade A Tuberculin Tested Milk" must be compensated for by an addition to the ordinary charges. The producer receives at least 3d. per gallon above the ordinary price.

In Reading the retail price of "Grade A Tuberculin Tested" milk is 3½d. per pint in the summer and 4d. per pint in the winter as compared with 3d. and 3½d. for ordinary milk.

For the extra ½d. per pint the consumer gets a satisfactory guarantee of purity and can use the milk for all purposes with confidence and is absolved from the losses through souring, which usually accompany milk dealt with in the ordinary way.

Speaking as a consumer there is no doubt that clean raw milk is

a highly attractive article and has advantages which more than compensate for the small increased cost. It is worth something not to be forced to boil one's supply in order to be able to use it.

Reading is only one of many provincial towns which have shown the entire feasibility of a clean raw milk supply and their experience has been to some extent translated to London, in many parts of which it is now possible to buy "Grade A Tuberculin Tested" milk at an extra cost at present of 1d. per pint.

There is no doubt that the dairy farmer is very largely dependent on the advice and skill of his veterinary surgeon in the building up of a tubercle-free herd—and the growth of tuberculin tested milk, therefore, is to a great extent in the hands of the veterinary profession.

THE BACTERIOLOGICAL CONTENT OF "GRADE A (TUBERCULIN TESTED) MILK."

Weekly samples of morning and evening milk from the same producer over a 12-month period commencing October, 1925.

Column 1.—Results of the examination of samples of milk from 10-gallon churns as delivered to the retailer.

Column 2.—The same milk after bottling by the retailer as delivered to the consumer.

These results were obtained on the premises of a licensed retailer in the ordinary course of his work.

Age of milk when tested: Evening milk, 23 hours old; morning milk, 10 hours old.

Examination of 93 *Samples of Milk.*

Date.	Samples Taken from Churns as Delivered to Retailer by Farmer.		
	Under 10,000 Bacteria per 1 c.c.	Under 30,000 Bacteria per 1 c.c.	Under 200,000 Bacteria per 1 c.c.
	88	91	92
5.10.25 to 24.9.26	Samples from the Same Milk After Bottling by Retailer.		
	Under 100,000 Bacteria per 1 c.c.	Under 30,000 Bacteria per 1 c.c.	Under 200,000 Bacteria per 1 c.c.
	84	88	91

PULMONARY STRONGYLOSIS IN SHEEP.

By W. LYLE STEWART, M.R.C.V.S.,
AND
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ALTHOUGH this condition is by no means rare, it is of interest to put on record the findings, both clinical and pathological, of an attack which occurred during the past autumn and early winter amongst flocks of sheep, where an epizootic disease was evidently present. The affected animals were invariably lambs, no adult sheep being affected. General "unthriftiness" and loss of condition were the outstanding symptoms observed by the owner. While it is generally believed that parasitic infections are enzootic in sheep, the history in two instances suggested that in previous years little damage had occurred, whereas in the flocks in question many of the animals were moribund when first seen. *Post-mortem* examination in fatal cases showed infection with lung-worms to be the cause.

DESCRIPTION OF PARASITE.—The worm was recognised to be the Strongylus filaria, and was found in the secretions from the naso-pharynx, in the naso-pharynx, respiratory passages, lungs and fæces. Both male and female specimens, embryos and ova were found. The adult worms measured from $1\frac{3}{4}''$ to $3\frac{1}{4}''$ in length, and are distinguished from one another by the male being shorter, and having the anterior cleft on the bursa. The female is longer, having a pointed posterior end with the genital pore somewhat behind the mid-line of the body. The ova are oval and minute, measuring about 100 μ in the longest axis, and within them the embryos are seen to be well developed.

The life history of this parasite is somewhat obscure, but immediately after the eggs are deposited by the female in the body (e.g., bronchi, etc.) the embryos hatch out.

Sheep and goats, in the early months of life are especially prone to the infection, though adults may suffer should their general vitality be lowered from an intercurrent affection.

SYMPTOMS.—In the flocks observed by the authors, about 60 lambs had gone back in condition after weaning in August, when they were placed on aftermath, consisting of wild white clover and cocksfoot. In spite of hand-feeding with cakes, they continued to lose flesh. Some developed diarrhœa, and then indications of bronchial catarrh with coughing and sneezing supervened. The cough had a husky character, and was especially noted when the animals were disturbed and made to move rapidly. From the noses of some of the affected lambs a sero-mucoid discharge appeared in which were found ova of the causative parasites. The nasal irritation caused the sheep to rub their noses on the ground. In the more acute cases when the broncho-

pneumonic symptoms became pronounced, signs of asphyxia, dyspnœa with rapid mouth-breathing and head depression, were a feature. The loss of condition progressively increased, appetite became poor, and the owner detected a dullness of the coat, the fleece becoming harsh and dry, and was easily plucked out. The animals had a haggard look, and a few could scarcely stand, having become emaciated, and the visible mucous membranes were exceedingly pale. Several deaths occurred.

DURATION.—In the acute cases death resulted in two or three weeks, but in the more chronic, the disease lasted from three to four months. Mild attacks can evidently end in spontaneous recovery.

POST-MORTEM FINDINGS.—The main lesions discovered were confined entirely to the respiratory tract and lungs. The animals were

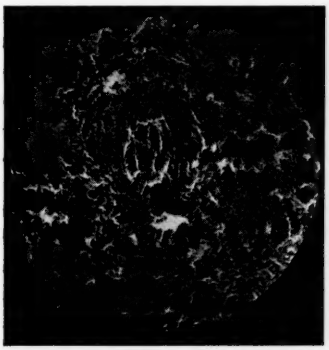

FIG. 1 (×60).—The microphotograph shows a broncho-pneumonic consolidation with collapse.

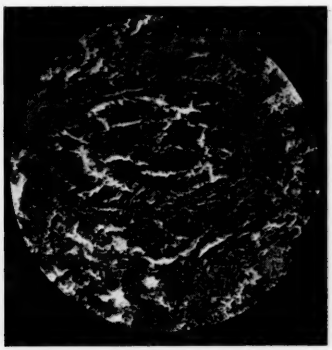

FIG. 2 (×120).—High power view of previous figure showing the inflammatory exudate in a bronchiole and surrounding alveoli.

anæmic, and their carcases emaciated. The organs generally showed evidence of wasting and toxic change. The heart, liver and kidneys showed marked fatty degeneration. The spleen was slightly enlarged and soft and the seat of toxic change.

TRACHEA AND BRONCHI.—Within the larger and medium-sized bronchi were tangled masses of worms coiled together length-ways. In addition a quantity of sero-purulent hæmorrhagic exudate was present, and the walls of the naso-pharynx, trachea and bronchi all showed evidence of an acute inflammatory change, being congested and inflamed. A degree of peribronchial thickening was also seen, indicating that the condition was of some duration.

LUNGS.—The strongyli were traced into the smaller bronchioles in the lungs themselves. There was no pleurisy. On section the lungs

showed a patchy consolidation, paler areas of consolidation, from the centres of which muco-pus could be expressed and occasionally worms, alternating with darker areas of collapse. There were small bullæ in the interstitial fibrous septa at the margins (interstitial emphysema) from persistent coughing. In other cases the appearances of the lung may be so slight as not to be noticeable, and only a frothy brownish sero-fibrinous exudate can be expressed from the bronchioles. The diagnosis in these cases can only be confirmed on the discovery of the broncho-pneumonia by microscopical examination.

HISTOLOGICAL EXAMINATION OF LUNGS.—The microscopical appearances are those of an acute broncho-pneumonia (Fig. 1). The bronchioles being filled with exudate (Fig. 2) and some of them show a single worm cut in cross-section (Fig. 3). The alveoli in the immediate vicinity are packed with inflammatory cells and fibrin, but no worms can be detected in them. In other areas the lung tissue is collapsed, the alveolar walls lying in close proximity, and the alveolar spaces filled with catarrhal desquamated lining cells.

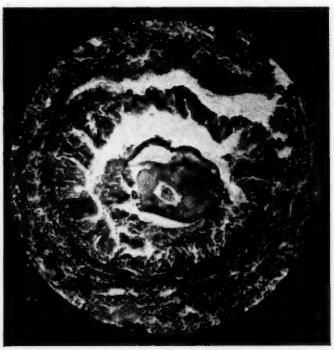

FIG. 3 (×90).—The microphotograph shows a bronchiole containing a single strongylus filaria in cross-section and inflammatory exudate.

Under high power the cells in the bronchioles are seen to be mainly polymorphonuclear leucocytes, desquamated lining cells, and some red-blood corpuscles extravasated from the distended blood-vessels in their walls. The alveoli immediately surrounding them are filled with similar inflammatory cells and contain some fibrin as well. Areas of compensatory emphysematous ballooning of the air vesicles are also seen—some air-spaces being present in the interstitial tissue as well.

DISCUSSION.

The cause of death would appear to be due to a capillary bronchitis with extension of the inflammatory process to the lungs and the development of an acute broncho-pneumonia, resulting from the presence of the strongylus filaria. As has been already noted none of these were found in the lung alveoli themselves. They seem to act as foreign bodies in the bronchioles and set up irritation and inflammation with secondary bacterial infection as a terminal event. The debility, anæmia, and exhaustion act as contributory causes. There

is a close analogy in this condition to the broncho-pneumonias which affect children in whom occasional cases of pneumonia occur due to the nematode worm, ascaris lumbricoides. In experimental infection of mice, guinea pigs, rabbits, goats, sheep and monkeys by ripe ascaris eggs, the larvæ or a proportion of them, on being hatched out, bore their way into the liver and lungs, and if the dose of eggs has been a large one, may cause a fatal pneumonia (Manson-Bahr 1925). Thus the fact that the disease attacks lambs chiefly, would apparently depend on the bronchial mucosa of the adult being more resistant to the infection, and this is borne out by the condition being comparatively rare in healthy adult sheep. It is unusual in them to find a descending infection, or should this occur, they seem more able to combat the condition, and spontaneous cure results. Lambs, on the other hand, may possibly not be able to expel the parasites to the same extent when these are aspirated.

As regards the epizootiology of pulmonary strongylosis in sheep, the disease seems to occur most frequently in the autumn, especially when the climatic conditions are favourable to the development of the parasites. Undoubtedly moist warm weather is an important contributory factor. The type of pasture may also aid the occurrence inasmuch as good pasture tends to be overstocked.

REFERENCE.

Manson-Bahr (1925): Textbook on Tropical Diseases, 1925, p. 718.

A PECULIAR EQUINE SARCOSPORIDIUM IN THE ANGLO-EGYPTIAN SUDAN.

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Opinion as to the pathogenic significance of sarcosporidia in domestic animals is divided, but on the whole it seems that they are considered to be of minor importance. It is therefore of interest to describe a recently-observed case in the Anglo-Egyptian Sudan in which the pathogenic role of the parasite appears to be in little doubt. It is, however, necessary to state that the parasite under consideration presents some features which, as far as can be ascertained from the available literature, make it probable that a new species is at issue.

History of the Case.

The subject was a Sudan country-bred riding pony, probably of unmixed local blood, about nine years of age, which had been in regular work until eight or nine months before its present condition came to notice. Then, while at Talodi (Nuba Mountains) it developed symptoms of weakness, with swelling of the legs and eruptions of the skin, followed by falling out of hair in patches. No veterinary advice

was available at the time and the horse was rested and well-fed for about three months, during which time it improved sufficiently to be put to work again. In work, however, the original weakness re-developed, and in spite of general good treatment it remained weak and the legs were continually swollen.

When seen by a veterinary officer* trypanosomiasis was naturally suspected, both on account of the history of the case and because the animal had been working in possible "fly" country. Blood smears were sent to the laboratory in Khartoum, but no trypanosomes could be detected. Large numbers of other foreign bodies were, however, seen in the blood which were ultimately diagnosed as sarcospores, although they were not at first recognised as such. A request was made for further smears to be sent after a short interval, and these, when examined by various staining methods, presented the same appearance as the original specimens. Arrangements were then made for the horse to be sent to the Research Laboratory in Khartoum for further observation.

Symptoms.

The horse was kept under observation for four weeks and maintained a fairly constant appearance throughout. Respirations when at rest were normal, but otherwise the horse constituted a picture of intense dejection, with hanging head, drooping ears, thickened eyelids with half-closed eyes, harsh dirty coat, and swollen scurfy legs. The pulse was normal, the conjunctiva was of a peculiar brick-red colour, with a few petechiæ, the buccal mucous membrane was pale, but not icteric and seemed always to be dry. No appreciable enlargement of the palpable lymphatic glands could be established, nor was there pain on palpation or percussion of any part of the body.

When forced to move, the horse was seen to be incapable of more than dragging its legs along at the end of four or five minutes, but in spite of this, no appreciable change was noticed in the pulse or respiration. In fact, the symptoms were those of sheer muscular incapacity and apparently nothing else.

The appetite remained good throughout, but thirst was excessive; fæces and urine also showed no abnormality.

The temperature was slightly elevated throughout, irregular generally, and showing rather exaggerated diurnal variation—a chart of persistent irregular low fever.

Blood preparations, both stained and fresh, were examined daily, but no trypanosomes or parasites other than sarcospores were ever

* Thanks are due to Capt. J. Going, of this Department, for first bringing the case to notice, and later for arranging to send the horse to Khartoum for further observation.

seen. The latter were constantly present, although varying in number from day to day. It was noticed, however, that variation in the number of parasites was quite independent of variation of the body temperature. Further, the blood picture itself, apart from the presence of sarcospores, was always normal.

Post-mortem Examination.

At the end of four weeks it was decided to slaughter the patient, as no useful purpose could be served by keeping it alive. The results of the *post-mortem* examination were as follows :—

External Appearance.—As described among the symptoms during life, the most noticeable features being the scurfy skin and the thickened eyelids and legs. Portions of skin were excised for subsequent histological examination.

Section.—It is not necessary to record systematically the appearance of all organs and tissues since these generally seemed to be normal. The obvious abnormalities were sufficiently striking, being limited to the muscles on the one hand and the mucous membrane of the laryngeal region on the other.

All the muscles of the body were pale brown in colour and evidently affected in an advanced degree with some form of degeneration. The friability was so extreme that even with a very sharp knife it was almost impossible to excise a small firm block of the tissue suitable for embedding in paraffin. Examination of a large number of incisions with the naked eye and with a hand lens failed, however, to reveal the presence of any sarcocysts. In order to complete the study, pieces of Masseter, Biceps Femoris, Psoas Major and Brachiocephalicus were excised for microscopical examination.

In the other area of infection an equally striking but entirely different picture was presented. The mucous membrane covering the whole of the larynx anterior to the glottis, the oral surface of the tip of the soft palate—but not the base or the pillars of this structure—and the glosso-epiglottic fold were studded with very large numbers of small whitish nodules having an average diameter of between half and three-quarters of a millimetre. The nodules were most densely crowded over the vocal cords and false vocal cords, being here so close as to constitute a continuous roughened surface. Over the apices of the arytenoids and the epiglottis they were more scattered, but were still so numerous as to leave no clear area of more than about two millimetres square. On the glosso-epiglottic fold and the tip of the soft palate there was a marked progressive thinning out, until the main portion of the latter and the base of the tongue appeared to be free. No nodules could be seen in the laryngeal saccules, nor in the

posterior larynx, and further dissection failed to reveal any in the pharynx, œsophagus or trachea.

No further dissection of the larynx was performed as it was decided to retain the organ as a museum specimen, but from the foregoing description it is evident that the infestation was most intense over those portions of larynx lined with stratified epithelium, becoming gradually less intense in the adjacent structures similarly lined as the distance from the centre became greater. Structures lined with ciliated epithelium appeared to be free from infection, being in the larynx at any rate, demarcated by an abrupt line. Pieces of glosso-epiglottic fold and soft palate were excised for embedding, and a few nodules were crushed for immediate microscopic examination.

All other organs and tissues of the body appeared to be normal, but pieces of liver, spleen, kidney, lung, œsophagus and heart muscle were preserved for embedding.

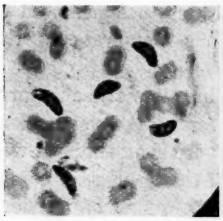

FIG. 1. Free "ripe" spores in the thin parts of a blood smear, Giemsa stain, × 1,000.

FIG. 2. The same spores in the thick part of a blood smear, Giemsa stain, × 1,000.

FIG. 3. "Unripe" spores from a crushed laryngeal nodule, Carbol fuchsin stain, × 1,000.

MORPHOLOGY AND PATHOLOGY OF THE PARASITES.

(1) *The Blood.*—The bodies found free in the blood—presumably "ripe" sarcospores—presented two morphological forms depending on the portion of the blood smear examined. In the thin, evenly spread area in the centre of the film they were fairly uniform in shape and size, being something between kidney-shaped and sausage-shaped, about 10 μ long and 4 μ broad. On some days they were only to be found after several minutes' search, while on other days they were very numerous, as many as five or six often being visible in a single oil-immersion field (Fig. 1). Stained by the usual eosinazur methods (Leishman and Giemsa), the spores assumed a more or less uniform purple-violet tint; careful focussing showed them to have a finely granular structure. In some individuals the colouring was not even, giving the appearance of greater or lesser vacuolation in the body of the spore.

In the thicker parts of the smears the spores were always numerous, even when difficulty was experienced in finding them in the centre of the smear. They behaved, in fact, as though their physical characters resembled those of leucocytes. Owing to the large numbers in which they clumped together—often hundreds—it was not easy to select individuals for detailed observation.

Such spores as could be separately examined were of about the same length as those in the thin fields, but were only about half as broad, and thus more crescentic in outline. With Romanowsky stains, instead of assuming a fairly uniform purple-violet tint, the granules were always collected together in the middle of the crescent, giving the impression of a dense, deeply purple staining granular nucleus, while the remainder of the spore body was stained pale blue. Some individuals possessed, in addition, a smaller clump of granules at one pole. Occurring as they did in the thicker parts of the smear only, these bodies were difficult to photograph, but two fairly representative individuals are shown in Fig. 2. Both forms of spore could be stained with hæmatein and with basic aniline dyes, but the details of structure were less clear than with neutral stains.

(2) *The Laryngeal Nodules* (*sarcocysts*).—A few nodules from the mucous membrane were crushed and the contents stained by various methods. One could only see, however, that the nodules contained large numbers of crescentic bodies together with a certain amount of amorphous debris. No structure could be made out, and the bodies were generally rather smaller than those seen in the blood stream (Fig 3). The slightly smaller size and absence of recognisable structure is, presumably, referable to their being " unripe."

Histological examination of the tip of the soft palate showed that the cysts were distributed irregularly in the submucous connective tissue and between the lobules of the palatine glands (Fig. 4). Owing to the shrinkage in fixation they appeared to be somewhat smaller than in the fresh tissue. The individual crescentic spores could be easily distinguished by examining the edge of the cyst contents with a high-power objective. The four main points of interest in connection with the cysts were as follows :—

1. They were *not* most numerous in the muscular tissue. In fact in the deeper layers of the palate, among the fibres of the palatine muscles, they were rare. Even when in proximity to the muscular tissue the two did not seem to be associated in any way. The cysts occurred in the submucous connective tissue almost entirely, and this was obviously their predilection seat.

2. All cysts were approximately circular in section, indicating a spherical sarcocyst. The spherical shape was confirmed by cutting

sections in several planes and observing the circular outline of the cysts in every case. Even in the deeper layers, when lying between muscle fibres, no cyst of fusiform outline could be found.

3. Little or no tissue reaction was noticeable around the cysts, leucocytes and fibroblasts being rarely seen. Even staining by Van Gieson's method failed to demonstrate the presence of young fibrous tissue. (It must be admitted that in rare cases a few leucocytes were seen around the outside of a cyst, but the reason for this could not be determined. Leucocytes when present were invariably polynuclears.)

4. It seems certain that there was a progressive movement of cysts in the tissue from within outwards, as shown by their smaller size in the deeper layers and by the frequent occurrence of healing wounds and scar tissue at the surface. Examination under a high-power over a cyst very near to the surface frequently showed degenerating or dead epithelium cells.

The main features of the distribution and appearance of the cysts in the palatine mucous membrane, including a healing wound, are shown in Fig. 4.

(3) *The Skin.*—To the naked eye the skin while still on the animal, appeared to be thickened and scurfy. Pieces excised for further examination, however, presented no other obvious abnormality either to the naked eye or on examination with a hand lens. The epidermal surface when denuded of hair appeared perhaps somewhat rougher than normal, but not markedly so. Regarding the cut edges, the presence of follicles and glands prevented any naked eye diagnosis of sarcocysts.

On histological examination the appearance was almost exactly the same as seen in the laryngeal region. The predilection seats were the dermis and subcutaneous areolar tissue with rare individuals in the deeper layers. The spherical shape and the absence of tissue reaction were again very noticeable. Signs of migration towards the surface were also seen, and it appeared, further, that when the rete mucosum was reached, the final process of bursting through the skin must have been very rapid, since in a large number of sections examined no cyst was seen with its outer surface beyond the layer of prickle cells (see Fig. 5). The rapidity of the process was further made evident by the fact that only a single fresh rupture was seen (Fig. 6), although healing wounds were very numerous. This fact is unfortunate since the preparation reproduced in Fig. 6 was damaged in the dark room, but no other could be found to replace it in spite of cutting hundreds of sections. Having observed that the unruptured cysts were always below the prickle cells, and therefore below the skin pigment, together with the apparent rapidity of bursting and

healing, the difficulty of naked eye diagnosis was easily appreciated. These facts may further account for one's failure to find detailed descriptions of cutaneous sarcosporidiosis in the available literature.

(4) *The Œsophagus.*—Many sections were cut of the upper third of the œsophagus, but only a single sarcocyst was seen in the submucous areolar tissue ; it was circular in section. The rarity of cysts in the œsophagus, commonly a predilection seat of these parasites, is in keeping with the macroscopically observed diminution in numbers proportionate to the distance from the centre of infection in the larynx.

(5) *The Muscles.*—In spite of cutting very large numbers of thick sections of the various muscles not a single sarcocyst was seen. It was, however, noticed that all the muscles examined showed extensive Zenker's degeneration, with the exception of the heart muscle which was quite normal in appearance.

FIG. 4. Section of tip of soft palate vertical to the surface, Hæmalum and Eosin, × 25.

FIG. 5. Section of skin vertical to the surface, Hæmalum and Eosin, × 25.

FIG. 6. Site of Rupture of a cyst through the skin, Hæmalum and Eosin, × 45.

(6) *Other Organs.*—No microscopic abnormality could be seen in the liver, spleen, kidney or lung ; these being the only other tissues submitted to histological examination.

NATURE AND SIGNIFICANCE OF THE PARASITE.

The parasite described in this note has been treated as a sarcosporidium, and owing to the uncertainty existing in regard to the classification of such protozoa, it does not seem advisable further to discuss its systematic position. It is also not proposed to enter into any discussion of the relevant literature. It is known that sarcospores have occasionally been seen in blood preparations, although it is also noticeable that they have not always been recognised as such. It is also known that sarcospores have been found in smears made from nodules in skin eruptions, both in cattle and in horses, but in the available literature no description of a microscopic examination of the skin has been encountered.

XUM

Again, no record has been found of these parasites having the larynx as a predilection seat. In such literature as has been available it has, further, been noticed that in cases of sarcosporidiosis diagnosed by examination of blood smears or discharge from skin eruptions, the sarcocysts, when a search has been made for them, have been constantly, and as a rule chiefly, situated in the skeletal muscles, and moreover, they have been fusiform in shape.

In regard to pathogenicity, the present parasite has little of interest to offer. Zenker's degeneration of the skeletal muscles is common in animals infected with sarcosporidiosis, and in the subject under consideration this condition was only remarkable for its advanced degree, and the fact of its occurrence in all the muscles, although no sarcocysts could be found in them. In spite of a fairly lengthy close observation, no other disease could be found during life or after death, and one must conclude that this parasite itself was pathogenic.

It is admitted that the study here recorded has been incomplete in that all tissues of the subject were not submitted to histological examination. For instance, one can offer no opinion on the pathogenesis of the condition. The cysts found in the deeper layers of the laryngeal region and the skin were smaller than those which when "ripe" burst through the surface, but it is noteworthy—and annoying—that no very small cysts in an early stage of development were seen in any tissue examined. Having, however, provisionally recognised the condition as a sarcosporidiosis or something closely allied, detailed examination was limited in the main to the obviously infected tissues and such other organs and tissues as might be naturally supposed to harbour sarcocysts.

In conclusion, in spite of the incompleteness of the study, one may recognise two groups of features in which the present parasite seems to differ from other sarcocysts, namely, the morphology and the predilection seats. Regarding the former one may neglect the two appearances of the spores in thin and thick preparations respectively. They have been sufficiently described by many authors, if not always as sarcospores. The chief morphological feature is the spherical shape of the cyst as proved by a circular section in all planes. Regarding the predilection seats, it is known that other sarcocysts are not necessarily confined to the musculature, but in this case the muscles—as far as they were examined—appeared to be entirely free from parasites, cysts being found only in the dermis and subcutaneous connective tissue on the one hand, and in such parts of the laryngeal region as are lined with stratified epithelium.

OBSERVATIONS ON B. PULLORUM INFECTION OF COCK BIRDS.

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ALTHOUGH bacillary white diarrhœa has been closely studied in America and in this country during recent years, it has not yet been determined whether the cock bird takes any part in the propagation of the disease. It would at first appear that with such cheap and easily procurable experimental animals as poultry, the problem would not be a difficult one to solve. This is, however, not the case. One is immediately confronted with the difficulty of obtaining cock birds sufficiently infected, at least according to our present standard, to be worth testing in prolonged breeding experiments. The problem is further complicated by their great tendency to overcome infection and make a complete recovery in the course of a few months. Young chicks of both sexes are equally susceptible, but as development proceeds the majority of cocks appear to overcome infection and a small number only become carriers. The degree of reaction to the agglutination test in cock birds is less marked than in hens. It was mentioned in a previous publication* that as the result of work carried out at the Ministry's laboratory we now regard complete agglutination in a dilution of 1 : 25 as a positive reaction, indicating present infection; and that we were of the opinion that no normal agglutinins for the *B. pullorum* are present in the serum of healthy fowls. It was pointed out also that marked fluctuations in the agglutination titres of carrier hens are observed when tested at frequent intervals over a long period, but that this was of little practical importance as the titres very rarely fall below 1 : 25. Subsequent work has confirmed these observations in as far as they apply to hens. In naturally infected hens the titres (end-point) vary between 1 : 25 and 1 : 1,000 or higher; in the majority of cases they lie between 1 : 50 and 1 : 200. Beach and his collaborators† have in a recent publication cast doubt on the value of the test for the elimination of carriers, but as 1 : 50 was the lowest dilution employed by them it is not surprising that the results obtained were poor. In our experience the test is delicate, reliable, and of indisputable value for the detection of carrier birds, but, like other serological methods of diagnosis, is not infallible. When properly carried out and correctly interpreted the percentage of error is small and does not diminish, to any appreciable extent, its practical value.

Fluctuations in titre are of great importance in the case of infected cocks, and if not taken into consideration may make all the difference

* *Jour. Comp. Path. and Ther.*, Vol. XXXVIII, p. 266.

† Beach, Halpin and Lampman, *Jour. Amer. Vet. Med. Assoc.*, Vol. XXIII, No. 5, p. 605.

TABLE I.
Distribution of B. pullorum in Infected Cock Birds.

Number of Bird.	Agglutination Tests.			*B. pullorum* Recovered from	Result of *Post Mortem* Examination.
	1st Test.	2nd Test.	3rd Test.		
214	1 : 25	1 : 25	1 : 25	Necrotic area in heart muscle.	Grey necrotic area in heart muscle.
490	1 : 25	1 : 25	1 : 15	Spleen and testes.	Normal.
454	1 : 25	1 : 25	1 : 20	Negative.	Grey necrotic area in heart muscle.
429	1 : 25	1 : 25	1 : 20	Testes.	Normal.
219	1 : 25	1 : 25	Negative	Testes.	Normal.
251	1 : 25	1 : 25	1 : 25	Negative.	Normal.
249	1 : 25	1 : 25	1 : 20	Testes and gall-bladder	Testes appeared to be atrophied
396	1 : 25	1 : 25	1 : 50	Spleen.	Normal.
410	1 : 25	1 : 15	1 : 25	Negative.	Testes appeared to be atrophied
212	1 : 25	1 : 15	1 : 25	Testes.	Grey necrotic area in heart muscle.
406	1 : 25	1 : 10	1 : 15	Negative.	Normal.
224	1 : 25	1 : 10	1 : 20	Spleen.	Normal.
498	1 : 25	1 : 20	1 : 15	Testes.	Normal.

between a negative and a positive reaction. In the majority of cocks the titre is in the neighbourhood of 1 : 25 ; it is exceptional to find one as high as 1 : 50. Therefore, in the routine testing of flocks, when 1 : 25 is the lowest dilution employed, any infected cock bird which has a titre below this point at the time of examination will escape detection and may, for all we know, be capable of transmitting the disease. A glance at Table I, which gives the results of three successive tests of reacting cocks, will show this is of frequent occurrence ; these results have been confirmed by bacteriological examination. In six of the thirteen birds examined the titres were below 1 : 25, nevertheless, the *B. pullorum* was recovered from one or other of the internal organs. In one case it was isolated from the testes of a bird which was a non-reactor at the time of examination, but which had given a positive reaction a month previously.

In view of these results it is advisable when testing cock birds to accept a positive reaction in a dilution of 1 : 15 as indicating infection. As, however, positive reactions in low dilutions may be due either to a temporary drop in the agglutinin content of the blood, or to their gradual elimination as a sequel to the bird having overcome infection, a second test, after an interval of one month, is indicated to ascertain which of these factors is involved before finally rejecting the bird for breeding purposes ; this applies particularly in the case of valuable stock.

The " first test " was made with serum sent to the laboratory by the owner. Many of the reacting birds were purchased by, or presented to, the laboratory for experimental purposes. We take this opportunity of acknowledging our indebtedness to those breeders who generously presented the birds.

The " second test " was made on the arrival of the birds at the laboratory, about three weeks after the first test.

The " third test " was made from about one month to five weeks after the second, just before the bird was killed for examination.

Transmission Experiments.

No. 1.—This experiment was carried out to determine whether reacting cock birds could transmit infection by coitus to the eggs laid by healthy (non-reacting) hens. The results were controlled by monthly agglutination tests.

Two cocks, with agglutination titres of 1 : 25 and 1 : 50 respectively, were put with six pullets. The experiment was conducted over a period of 130 days ; and was discontinued eventually as the cock birds overcame infection and ceased to react to the agglutination test. One hundred and sixty eggs were laid during the period the

birds were under observation. Ninety eggs were examined by the cultural method, employing the usual technique (*); and 60 were artificially incubated. The incubated eggs hatched out a fair average percentage of normal chicks; the infertile eggs were negative on bacteriological examination.

From one egg, laid about the twenty-first day, the *B. pullorum* was isolated by the cultural method. Unfortunately, through an oversight when the experiment was discontinued, a bacteriological examination of the organs of the hen which laid this egg was not made: and as we know that in isolated cases the agglutination test is at fault and fails to register a positive reaction with an infected bird, the value of this observation is to a great extent destroyed. On the other hand, there is every reason to believe the birds were free of infection; they were obtained from a known healthy farm and gave uniformly negative results to successive agglutination tests; in addition, a bacteriological examination of the internal organs of four of the remaining birds gave negative results. In view, however, of this unexpected result it is proposed to repeat the experiment on a more extensive scale in the near future.

No. 2.—This experiment was undertaken to determine whether healthy cock birds could contract infection from contact with infected hens.

Two healthy cock birds were put with 17 naturally infected carrier hens, received from outbreaks in different parts of the country. The cocks were subjected to monthly agglutination tests over a period of six months and gave uniformly negative results. At the end of this period they were killed and a bacteriological examination made of the internal organs; in both cases the results were negative.

This experiment has been repeated twice; in one case a healthy cock bird was left with infected hens for seven months, and in another for five months. At the end of these periods both birds gave negative reactions to the agglutination test, and bacteriological examination of the internal organs was also negative.

It appears reasonable to conclude from these experiments that adult cock birds do not readily contract the disease from contact with infected hens.

Conclusions.

1.—As a general rule, the agglutination titre of "carrier" cock birds is considerably lower than in "carrier" hens.

2.—When testing cocks, complete agglutination in a dilution of 1 : 15 should be accepted as indicating infection; but a second test, after an interval of one month, is advisable to ascertain whether the low titre is due to fluctuations in the agglutinin content of the

blood or to their elimination as a result of the bird overcoming infection.

3.—Out of 13 naturally infected cock birds, the *B. pullorum* has been isolated from the testes (6), spleen (3), gall-bladder wall (1) and the heart muscle (1).

A CASE OF PROGRESSIVE INFECUNDITY IN A RAM.

By Y. TAMURA and J. E. NICHOLS,
Animal Breeding Research Department, University of Edinburgh.

The following case is put on record as an example of progressive infecundity in a ram due to increasing bilateral stenosis of the vasa deferentia.

The ram, a pedigree Suffolk, was first used at the age of seven months, when he served 25 ewes out of 30 allotted him; 13 only proved in lamb, producing 17 lambs. At the age of 19 months he was mated with 50 ewes and served all, but only four proved in lamb; two were served early in the season and the other two after about two to three months. In the following season, the ram, then aged 31 months, was specially cared for and allowed access to his ewes, 40 in number, for a few hours only each day; of the 40 ewes only three proved in lamb and these were served at the commencement of his service period. The ram had at all times exhibited the usual desire and activity in coitus and it was decided to attempt to stimulate his reproductive activity by grafts of testicular fragments some few weeks before the next service season.

The operation took place on July 18th, 1926, after the animal had been starved for 24 hours. A general anæsthetic (G.E. mixture) was applied and a linear incision made into the muscles behind the left shoulder; portions of testicular tissue from a Suffolk ram lamb, simultaneously castrated, were inserted into the incision and the wound closed by a double line of interrupted sutures. The ram recovered satisfactorily from anæsthesia, though the following day slight feverish symptoms were exhibited though not more than usual following general anæsthesia; the wound showed no signs of sepsis or infection. On July 20th the ram showed laboured respiration and a temperature of 106° F., with other symptoms of acute congestion of the lungs, but took food and water. Later acute pneumonia was diagnosed and treatment carried out, but the ram died on the morning of July 21st. The day of the operation was extremely hot, and the ram was distinctly fat.

Post mortem the reproductive organs were removed and carefully examined, with the following findings:—

Right Testis (Figs. 1B and 3).—The testis and epididymis were

quite normal in appearance and size, though the testis was somewhat congested. The vas deferens was normal in appearance, but was ruptured at a distance of 2.3 cm. from the point of attachment to the epididymis (Fig. 2A). This rupture was definitely caused during life. On the cut surface of the testis numerous white patches were found; microscopical examination revealed that they were accumulations of cellular debris within the tubules.

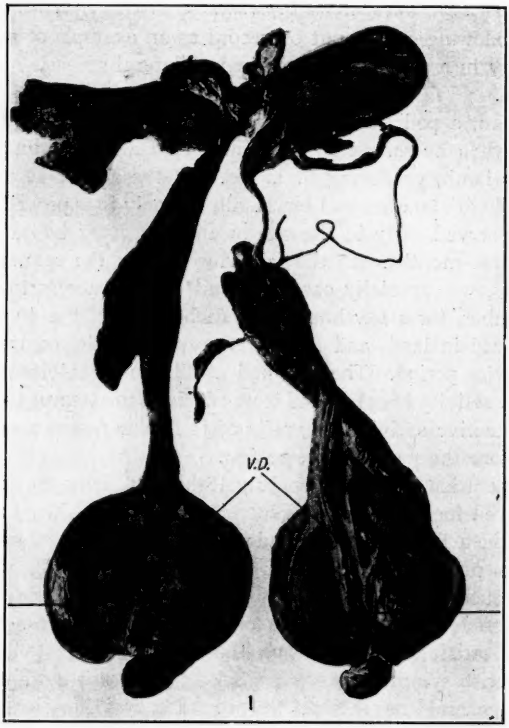


FIG. 1.—General View of Genital Organs. (A) Ruptured portion of vas deferens on left testis; (B) Occluded portion of vas deferens on right testis.

HISTOLOGY (Fig. 5).—The testis was highly degenerated and very few heads of dead spermatozoa could be found in several tubules among cellular debris. The most striking feature was that the basement membrane surrounding the tubules was distinctly well developed.

In the majority of the tubules the germinal layer had completely degenerated; layers of degenerated cells were situated next to the

basement membrane, and in some tubules a few normal spermatogonial cells were present. No other kind of germinal cells could be identified with certainty. Within the tubules there was abundant cell debris, heads of dead spermatozoa being present in some, and when this was the case more or less distinct tubular structure could be identified.

In the tubules where advanced degeneration had occurred, the germinal cells had desquamated and the tubules contained degenerated, sloughed cells and cellular debris. As degeneration advanced, the tubules became more and more irregular in shape and smaller in

FIG. 2.—Left Testis. (A) Site of rupture of vas deferens.

diameter and contained nothing but cell debris. In the final stage the cellular debris within the tubules had almost or completely disappeared, and the tubules consisted only of an irregular shrunken, well developed basement membrane.

Interstitial cells could not be identified, but intertubular connective tissue on the whole was more prominent than in the normal testis.

EPIDIDYMIS.—The epithelial cells of the epididymal tubules were quite normal, although the intertubular connective tissue was prominent. Within the tubules there was seminal debris mixed with dead sperm which was more abundant than in the testicular tubules,

but far less so than in the normal epididymis. In some tubules only a small amount of seminal debris and some fluid were present. On the whole, the contents of the epididymal tubules were scanty.

LEFT TESTIS (Figs. 1A and 2).—The morphological appearance of the testis and epididymis was exactly the same as that of the right. The right vas deferens was occluded for a distance of about 1 cm. in the portion roughly corresponding to the site of the rupture on the right as is seen in Fig. 3B ; there was practically no lumen. As was the case in the right testis, white patches were present on the cut

FIG. 3.—Right Testis. (B) Site of occlusion of vas deferens.

surface and their structure was identical with that of those in the right testis.

HISTOLOGY (Fig. 4).—The degenerative changes were far more advanced than in the right testis. Microscopical examination of a great number of sections from several parts of the testis failed to reveal the presence of spermatozoa. All the varieties of germinal cells were profoundly degenerate and fatty infiltration had set in. There was far less cell debris than in the case of the right testis, but the Sertoli cells were more prominent.

The basement membrane as well as the intertubular connective

tissue was well developed as was also observed in the right, and interstitial cells could not be identified.

EPIDIDYMIS.—As on the right, the epithelial cells of the epididymal tubules were normal, but the quantity of the testicular debris was far smaller than in the right. As in the case of the testis, microscopical examination of sections failed to reveal the presence of sperm in the tubules. Many tubules were practically empty.

These findings are in accordance with those described by Greenwood* in the case of a goat in which there had been complete stenosis of the vasa deferentia caused by a totally different pathological condition.

GRAFT.—The graft had necrosed heavily; all kinds of germinal cells were affected by necrosis. Careful examination of the section failed to reveal even Sertoli cells. Only the basement membrane remained and a small number of the heads of dead sperm were found.

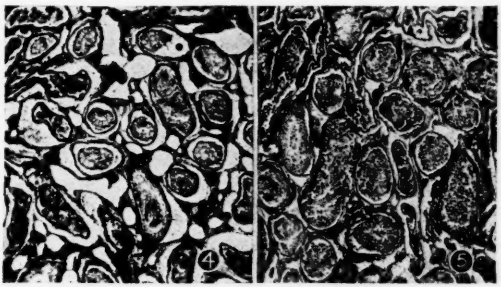


FIG. 4.—Left Testis. ×55. FIG. 5.—Right Testis. ×55.

DISCUSSION.—The case is one of old-standing traumatic bilateral vasectomy with subsequent occlusion of the torn ends of the vasa deferentia. The degree and extent of the degenerative changes in the testes and the history of the ram indicate that the section of the vasa had occurred some considerable time before the examination was made. It may be assumed that the results of the occlusion were retention and accumulation of mature sperm in the epididymis and efferent ducts and later within the testicular tubules, this being preceded by definite degenerative changes following a cessation of spermatogenic activity, the degeneration being caused by increased intertubular pressure and the production of toxic substances by the breaking down of the masses of accumulated sperm. It is not known what caused the trauma. It is possible that the ram was caught in

* THE VETERINARY JOURNAL, Vol. 82, 1926.

a fence or was kicked in such a way as to produce sudden violent traction upon the scrotum and contained testes, and that this injury caused rupture of both vasa deferentia. Since, however, the degeneration of the testicular elements was much more marked on the right than on the left side, it can be assumed that the occlusion of the right vas was complete, before that of the left. It is possible that the left was but incompletely torn at the time of injury and that its occlusion was subsequently and progressively produced by chronic inflammatory changes. Such an explanation can accommodate the fact that the ram did not become totally infecund immediately after the suggested injury and that fecundity slowly and progressively gave place to infecundity.

We wish to thank Dr. Crew for the help that he has given to us during the course of this study.

STERILIZED (?) MILK: AN ACTUAL INCIDENT.

By A CLASS D STUDENT,
*Royal Veterinary College, Camden Town, N.W.*1.

THE making of hygienic regulations is one thing, but the carrying out of these regulations is another, and the following little incident is well worth putting on record.

It occurred about 10 a.m. one Saturday morning in a district of the north of London, and I was an eye-witness.

A milkman was standing by the side of the pavement with the usual milk can on wheels, tap attached, and all complete. The boy collected bottles from the houses as he went along and brought them to the milk barrow, where the man deliberately filled them up again, and the boy put his hand into his greasy coat pocket, pulled out some of the round cardboard discs, and affixed them firmly with his dirty fingers. Replacing the full bottles on the barrow, the man proceeded on his journey and delivered them to his unsuspecting customers.

Clinical Articles

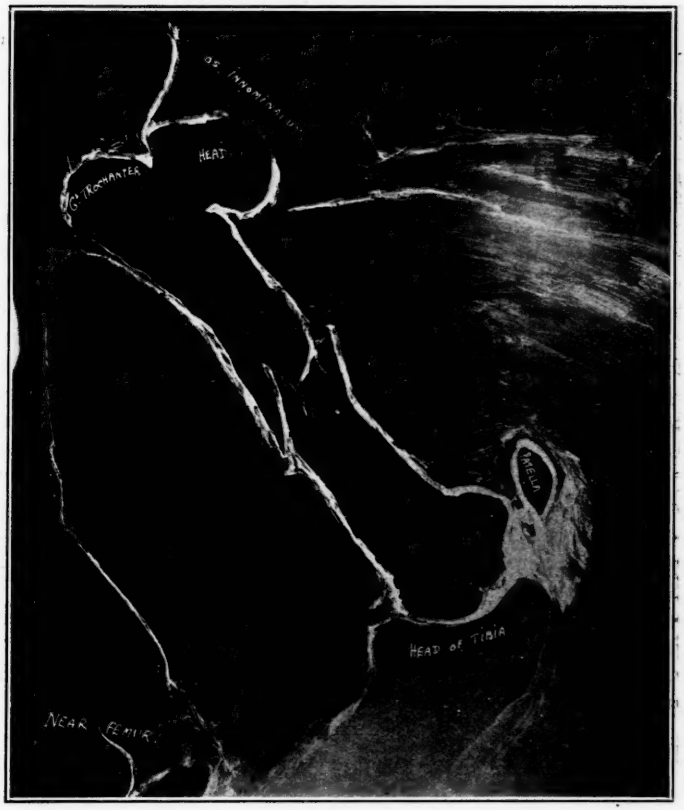
FRACTURE OF THE RIGHT FEMUR IN A FILLY FOAL.

By J. F. D. TUTT, M.R.C.V.S.,
Winchester.

THE accompanying X-ray photograph illustrates a fracture of the right femur, of the oblique spiral variety, a little above the middle of the shaft.

The patient is an eight weeks old thoroughbred filly foal by Lemberg out of Fianna (by Gay Crusader out of Fifinella), and the injury was due to a kick from the mare.

In the early stages there was considerable swelling with rise of temperature, and although crepitus could be distinctly heard, it was deemed advisable to obtain X-ray confirmation if possible, in view of the value of the patient. I accordingly asked my friend Dr. F. C. Jagger, who has frequently placed his valuable services at my disposal, to attempt an X-ray, and with great patience and pains, he brought



out his portable apparatus to the stud. He found, as he anticipated, that it was practically an impossibility to obtain satisfactory radiograms of the pelvis owing to the difficulty of getting through to the other side. The negatives were consequently so thin that it was impossible to print straightforward prints from them, and he has therefore outlined the bones and given a somewhat diagrammatic

representation of the condition, of course, exactly reproduced from the actual negative. The radiogram shows that there is a fracture of the femur. The displacement shown probably does not represent the correct amount, as if an antero-posterior view were possible we should very probably see some angulation outwards, or "bowing," at the seat of fracture. There appears to be no reason why a firm bony repair should not take place, although there will probably be some shortening and some bowing of the bone, and although the foal may be no use for racing purposes, there should be a good chance of saving it for breeding purposes.

LEUCODERMA IN AN ALSATIAN DOG.

By M. O'CONNELL, M.R.C.V.S.,
Southsea.

THE puppy at birth was quite normal in every way and weighed well above the average, being one of a litter of eleven. At three months old six of the litter showed symptoms of rachitis and five of them were destroyed. This one was not so badly effected, and after being treated made a good recovery, although it is not a sound dog at the present time. At the age of 4½ months white patches began to appear, starting inside the mouth and gradually working outwards along the lips and nose, so that at about nine months his lips, inside of mouth and nose were quite pink, with the exception of a few black spots on the upper surface of the nose—the pads also were effected and showed white patches. At this age he developed distemper and had it mildly, but ran a temperature of 104° for about five weeks, with no special complications. After the distemper rash had started to disappear, the dog began to improve, the black coming back in the same way as it went, commencing in the mouth. During the whole time of the distemper illness he had an excellent appetite; eating raw beef, fish, bone marrow, rabbit, eggs and milk, but was not given any Iron until he quite recovered. None of the remainder of the litter were affected with leucoderma.

IS COLD WATER CONTRAINDICATED IN CASES OF GASTRITIS IN DOGS?

By G. WENTWORTH ELAM, M.R.C.V.S.,
Liverpool.

PRACTITIONERS are well aware that in the majority of cases of gastritis in dogs, thirst is a marked symptom, but the one liquid a dog craves for most is cold water, no matter how filthy it may be. If this craving is met, the animal almost invariably vomits the cold water within one to two minutes afterwards. In the treatment of

gastritis we are told that dietetic treatment should as far as possible involve rest to the stomach and abstinence from all food which is irritating from its chemical composition or its mechanical state. When we consider the question of cold water we find that it excites vomition and aggravates the condition of gastritis considerably if given, therefore, to allow a dog access to a substance which causes repeated contraction of the already inflamed gastric walls and eventually brings about exhaustion, is in my opinion entirely wrong. There is no doubt that the cold water coming into contact with the inflamed gastric mucous membrane, which is of a considerably higher temperature, causes a reaction and the gastric walls contract in consequence. Moreover, the question of shock has also to be considered. I would certainly welcome the views of other practitioners on this question, for I myself find that gastritis in the dog causes me far less anxiety since I have adopted the plan of not permitting any cold water whatsoever to be given to the animal. To prevent a recurrence of the symptoms I insist that milk shall take the place of water for at least one month after the attack. I quite agree that medicinal and dietetic treatment are necessary, but if success is to be hoped for, there should be total abstinence from cold water.

TWO CASES OF ARSENIC POISONING.

By RAI SAHIB DABAKAR DEY, G.B.V.C., M.R.A.S.(Eng.),
Assistant Principal, Bengal Veterinary College, India.

THE subject matter of this note was two dogs who were maliciously poisoned by arsenic by some unknown hands. The two dogs used to be chained up in front of the house to guard the owner's place. They were really two disinterested canine friends of an elderly gentleman, who reared them since their infancy, after many ailments incidental on young dogs kept under captivity. The one succumbed to the cruel and mischievous act, and the other survived through proper care and suitable antidotes.

(1) The patient, a well-nourished male dog of Bhutia type, one year and nine months old, very strong, able-bodied and frisky. On the morning of December 20th, 1926, he was found to be in a state of collapse in his kennel. The temperature was sub-normal; the respirations were five per minute; the pulse was almost imperceptible and could only be felt on the tibial artery; the eyelids were kept closed and there was no reflex.

½ c.c. Pitutrin and 1/100th gr. each of Digitalin and Strychnine dissolved in ½ c.c. of distilled water were given subcutaneously at 5 a.m. Hot bottles were applied frequently over the regions of the heart and lungs, and between the fore and hind legs. At 6 a.m. the

respirations, pulse and temperature improved slightly. He opened the eyelids, the mucous membranes of which were found to be injected. He opened his mouth and was able to swallow. Andrenalin ½ c.c. was injected subcutaneously, and 1 gr. " Makaradhaj " incorporated and properly mixed up with honey and juice of " Pan leaves " with 1/100th gr. each of Strychnine and Digitalin were given per mouth. At 8 a.m. there were marked improvements in symptoms ; with some difficulty and when supported, he was able to stand up on his legs and drank about 1 pint of water. Egg flip was offered and he took it with relish. A glycerine enema was tried, and this brought out a good quantity of mucus-covered, blood-stained fæces. He passed some high-coloured urine also. The temperature was 101° F., respirations 13 per minute, and the pulse was very weak and thready, but no intermittency, and it numbered 52 per minute. No other stimulant and supportive than 1 dram of Spt. Vin Gallici with 2 ounces of milk was given every two hours.

At 2 p.m. the patient was decidedly better, walked and played with the attendants for more than an hour, took some rice and curry ; and the ignorant attendants, thinking that the dog was quite himself again, gave him plenty of exercise and his normal food and drink. In the evening the dog was again very bad and unconscious. The heart beats were tumultuous, the respirations were shallow, expiration double, and the breathing abdominal and difficult, and the poor canine friend expired after a few convulsive kicks.

No arsenic was suspected during life, as there were no erosions in the mouth, no diarrhœa, or any other specific signs of arsenic poisoning.

Autopsy revealed meningitis, endocarditis, myocarditis, pericarditis, gastritis, enteritis and cloudy swelling of the liver and kidneys.

The intestinal contents, with a portion of small and large intestines, and a portion of liver, were sent to the chemical examiner for analysis. The report of his findings was received after a week, which was positive to arsenic.

(2) The second case under report is a wire-haired English terrier bitch, aged one year and six months. It was an excellent watch-dog, and a companion to the dog previously reported, who fell ill on the next day, i.e., on the morning of the 21st instant. She presented all the symptoms shown by the former dog. Pituitrin, Strophanthus and Spt. Vin Gallici given and supportive and stimulant to keep up the action of the heart. As there were some erosions in the mouth with colicky pains and escape of yellowish liquid evacuations, arsenic was suspected, and at once 1 ounce of freshly prepared moist peroxide of iron was given. Within an hour after the administration of the

antidote, the animal stood up with swaying movements of the posterior region of her body. She behaved as if she had awakened from deep slumber. Glycerine enema brought out a fair quantity of solid, hard fæces covered with blood mucus and detached endothelial shreds. Half an ounce of Calol with 5 minims of peppermint oil and mucilage given at once, and " Makaradhaj " with Spt. Vin Gallici was repeated every four hours. A second dose of the antidote was given at 3 p.m., and the animal could drink some egg flip, raw meat juice and sour milk. The bitch became much better the next morning, but thirst increased and persisted for the three following days. Her diet consisted entirely of barley water, egg flips and whey for the subsequent week, and medicines consisted of " Makardhaj " (a preparation of Hydrargyrum) and Spt. Vin Gallici.

The report of the chemical examiner upon the first case only reached me on the 28th instant, as the offices were closed for the Christmas holidays.

Conclusion.—(*a*) Criminal poisoning in small animals, particularly in canines, is seldom practised in this country. Cases of poisoning amongst large cattle are common in India. " Chammars " and other unscrupulous persons, with guilty motives, sometimes systematically poison village cattle by means of yellow and white arsenic, Abrus Precatorius and infective fluids and solids of cattle plague and other deadly infective diseases of cattle. Their object is to secure as many hides as possible.

(*b*) Chemical antidotes, when judiciously given, act almost the same as they do in human subjects. When no history of poisoning is evident and animals suddenly fall ill, it is wise to suspect arsenic poisoning and treat the cases accordingly.

A THOROUGH SPRING-CLEANING.

By R. E. ALEXANDER, M.R.C.V.S.,
Weymouth.

I had occasion to administer an enema to a large Persian cat. The animal was placed on the operating table, and I had injected about a quart of fluid without any being returned, when the animal suddenly opened its mouth, and a jet of soapy water shot across the room. The water had passed straight through the alimentary canal in a remarkably short time without meeting any resistance.

There was not any ingesta present in the fluid, but there was a cluster of large tapeworms, complete with heads.

No water was voided from the rectum subsequently, so that the greater proportion of it must have entered the stomach.

The animal, which previously had been out of sorts and restless, slept for about 12 hours, after which it seemed quiet and contented.

DISTEMPER IN THE FERRET.*

By HENRY GRAY, M.R.C.V.S., *London.*

FERRETS, as is fairly well known, are subject to distemper—a disease which they may contract from the dog. I have satisfied myself on this point. It often occurs as an epizoötic, attacking ferrets all over the country about the same period. As well as being a very contagious disease, it is also a very fatal one, killing ferrets of all ages.

The disease is due to a filter-passing organism, which is in every respect identical with that causing distemper in the dog. The most characteristic form in the ferret is that with a thick yellowish discharge from the eyelids and nostrils. This is at first watery, but later it becomes greenish-yellow and thick, and when it dries up, closes the eyelids and cakes up or plugs the nostrils. It is accompanied by frequent sneezing, and as the nostrils become blocked, there is a snoring or a snuffing sound produced by the difficulty in breathing. There is also a frequent cough, and when the lungs become the seat of pneumonia, the breathing is rapid and distressed, and often of the pumping kind. Not infrequently there is pleurisy, when there may be a moaning noise emitted during every respiratory act. Enteritis is often seen, and its presence is evidenced by repeated vomiting and frequent diarrhœa, the fæcal discharges not rarely being tinged with blood. Occasionally in this enteric form the bowel becomes prolapsed outside the anus. In this case the prolapsed bowel is either the small intestine, which has telescoped through the ileo-cæcal opening or the rectum and colon, and even the cæcum.

There is intolerance to light, a great disinclination to come out of the nest, no desire for food; the internal temperature is high at first, but drops below subnormal when the comatose state sets in just before death takes place, which it does in most cases in from five to seven days after the commencement. The emaciation is extreme and rapid. *Skin eruptions and nervous complications are rarely noticed in ferrets*—no doubt because they generally hide themselves from view or die early from the complaint. As a rule they are found dead coiled up in the nest.

The *post-mortem* lesions are similar to those found in dogs which have died from distemper—pneumonia, pleurisy, enteritis, and more or less a catarrhal condition of the mucous membranes. The blood is prune-juice coloured, with no inclination to clot, but stains the fingers.

As most of the animals attacked die, there is little prospect of recovery from the treatment usually adopted late in the malady. Serum withdrawn from recovered dogs, in 2 cubic centimetres, may

* This article was previously published in *The Bazaar, Exchange and Mart*, Sept. 21, 1923.

be injected under the skin and repeated daily. For it to be efficacious it should be used before the usual complications have set in. Aspirin, in 2½ gr. doses, may be dissolved in fresh milk or sprinkled on a little fresh rabbit or other flesh, and repeated twice or thrice daily. During wet, cold, or chilly weather, the sick animals require to be kept very warm and scrupulously clean. A few drops of equal parts of oil of eucalyptus and beechwood creosote should be sprinkled on the floor of the sleeping compartment of the hutch for the animals to inhale. The eyelids, nostrils, and *lips* should be cleansed from time to time with a 1 per cent. solution of permanganate of potassium, or one part of solution of chlorinated soda in nine parts of water, and then smeared with boracic vaseline. A *careful examination of the ears* should be made to ascertain if they are free from parasitic canker, which develops very rapidly and causes acute ulceration of the internal organ when the system is weakened by distemper.

Recovered ferrets may carry the infection and spread it to others for some time. Before they are allowed to associate with "clean" ferrets they should be rubbed over with a piece of sponge saturated in one part of chlorinated soda solution to seven parts of water, taking care that all parts of the body, including the eyes, nostrils, and mouth are included in the dressing.

THE "CLEAN MILK" CAMPAIGN IN HUDDERSFIELD.

THE Report (April, 1926, to March 31st, 1927) of the work carried out by the Veterinary Officer of Huddersfield (Mr. John McKinna, F.R.C.V.S.), illustrates the good work which can be effected in a very short time by the moral suasion of a tactful veterinary official who knows, and is enthusiastic about, his job.

The approximate amount of milk produced in the Borough is 2,814 gallons per day, there being an average of 1,843 cows spread over some 156 farms. Altogether some 7,226 cows were examined and during the year 1,361 visits were paid to the above farms. Milk was taken and bacteriologically tested from every farm, the result "proving beyond all doubt that with strict attention to the details of cleanliness, irrespective of construction of cowsheds, it is possible to produce clean milk with but a little more labour."

Mr. McKinna draws special attention to the necessity for the education of the farmer in the necessary details of precautions necessary to ensure clean milk and writes hopefully in favour of the prospect which is already beginning to be in evidence as a sequel to the enforcement of the Milk and Dairies Act, which came io fntorce on the 1st of October, 1926.

XUM

Abstracts of Current Literature

Erban—The Prophylaxis of Tuberculosis of Fowls by the help of Injection of Tuberculin into the Wattles.—*B. Tierarzt Woch.*

AFTER a very complete and interesting review of the tuberculination of fowls the author gives his own experiences with 128 birds which gave 24 positive results, four doubtful and 100 negative. Of 24 reactors 23 were found affected at autopsy; of four doubtful two were tuberculous; of 100 non-reactors 10 have been *post-mortemed* and found healthy. The conclusions on the work are as follows:—

Intradermal inoculation of avian tuberculin into the wattles produces, in tuberculous fowls, a significant reaction; birds of all ages, pure or cross-bred, show the same susceptibility. A strong reaction is produced in acute, advancing tuberculosis, whilst the reaction is slightly positive in old lesions. Bovine tuberculin also gives the reaction. Injection into the wattles is a practical and convenient method for the early diagnosis of tuberculosis. It allows of cleaning up a flock by elimination of sick birds and removal of droppings which are buried deeply or burnt. After three weeks doubtful fowls, or those not reacting at the first test, are retested. It is advisable to renew the test at intervals of six to nine months.

———

[The test for fowls is one to three drops of tuberculin intradermally in the wattles. The reaction is the arising of a large doughy swelling 36 to 72 hours afterwards if TB. is present.—Ed.]

Em Leynen.—Paralysis of Chicks due to Coccidiosis.—*Annales de Méd. Vétérinaire*, March, 1925.

THIS malady is brought about by eimeria avium, host of the small intestine and cæcum of the fowl.

In adults the coccidium, almost always present, causes no illness; but it may be a carrier of germs which infect birds. The malady is observed about the 47th day; the feathers are ruffled up; the appetite persists or is exaggerated; a whitish chalky diarrhœa often streaked with blood is present; death occurs after 10 days. The mortality is greatest in young birds. At autopsy the cæcæ are enlarged, indented and full of hard excrement and blood; the mucosa is eroded or digested. Coccidia abound in the excrement and cæcal mucosa.

In older subjects general paralysis or paralysis of the limbs occurs. The fowls remain crouching, their limbs on the ground; they drag themselves along and flop their wings; the appetite remains. The bird becomes a skeleton and dies after 22 days.

The treatment comprises above all destruction of the oocysts evacuated in the droppings. These are collected each day and burnt;

a layer of quick lime is laid on the ground and it is turned over to a depth of 30 centimetres.

As medicine catechu 1 in 4,000 has given good results. One can also use Beach's régime successfully: reduction of the morning ration of grains or maize; followed by butter-milk up to three o'clock; this is taken away then to avoid fermentation in the crop during the night; ration of grain in the evening. Generally the malady is arrested after 18 days of this treatment.

Degoix, M.—Castration by Burdizzo Pincers.—*Recueil de Méd. Vét.*, Nov., 1925.

CASTRATION by Burdizzo pincers is a simple and easy method, and it is a pity its use is not general in France. It is sufficient to compress the cord between the jaws of the pincers for half a minute to obtain atrophy of the testicle. Sequelæ are always benign; a slight swelling following the operation. This method is particularly valuable in sheep, where castration by excision of the testicles is often followed by tetanus, etc. After the operation the testicle atrophies and ascends to the upper part of the scrotum to the level of the lower inguinal ring as in animals *bistournaged*, as a result of retraction of the cord. The testicular vessels, crushed, are obliterated; but the vas deferens remains intact; finer and more supple than the vessels, it escapes the pressure of the pincers.

The author has studied comparatively the development of two lots of sheep, the one done with the pincers, and the other by excision of the testicles and he observed that the latter method depreciated the sheep much more than the former. The "pincered" animals increased in weight much more rapidly than their co-mates.

Ex-*Revue Vétérinaire*, December, 1926.

[The Eschini Tongs would seem to be very useful for sheep.—Ed.]

Hruska, K.—Infection, Vaccination and Immunity in So-called Internal Anthrax.—*Centralbl. f. Bakt.* 1. Abt. Orig. Vol. 102, No. 4/5. April 12, 1927. Pp. 174-178.

ACCORDING to Koch and his school, anthrax is an intestinal mycosis caused by the germination of the spores in the intestinal tract, the other changes arising secondarily from a general infection. Pasteur, on the other hand, pointed out that it is difficult to infect guinea-pigs and sheep by food in which spores have been mixed. Only by adding pointed objects to the food did he succeed in killing sheep. Koch's view won the day. Besredka re-opened the discussion by attributing a special sensitivity for anthrax bacilli to the skin. His work has been partly confirmed, partly not confirmed.

XUM

Hruska's experiments were performed on the guinea-pig and rabbit by feeding through a hard rubber catheter (Gregory No. 6), care being taken not to injure the lining of the oesophagus or stomach when introducing it. Infection was also carried out *per rectum* in the same way. Anthrax culture on agar (bacilli and spores) floated on 50 cc. broth was used, and 10 cc. injected *per os* and *per rectum*. No guinea-pig or rabbit died after this enormous dose. The experiment was repeated—this time puncturing the heart or cutting the tongue or abdominal skin half an hour after the dose. Still no infection occurred. A guinea-pig dipped in broth anthrax culture did not die, but it died when the skin was scarified and the culture rubbed in. That is external anthrax. The same process occurs in internal anthrax, i.e., infection occurs only when the intestinal tract, pharynx, larynx or trachea is wounded. Otherwise the anthrax bacillus is only a saprophyte, and either is killed by the gastric acid or is evacuated with the excrement.

Attempts to obtain immunity by intestinal vaccination were successful in only one case out of 37.

Hruska's *Conclusions* are as follows :—

1. Intestinal anthrax mycosis in the sense of Koch's doctrine does not exist.

2. Internal and external anthrax are both of traumatic origin (accidental erosions and wounds of the epithelium of the larynx, pharynx, oesophagus, stomach, intestine, trachea and lung).

3. Bacilli and spores behave in the stomach and intestine like saprophytes and leave behind no immunity.

4. Anthraxbacilli do not pass through the mucosa of stomach and intestine into the blood.

5. The receptive cell for anthrax infection lies not only in the skin, but also in the intestine and probably also in the respiratory apparatus (Sanarelli).

6. The receptive intestinal cell seems to have the capacity of becoming infected (after trauma), but its capacity of being vaccinated and producing immunity seems to be very slight.

Reviews

Die Krankheiten des Rindes (The Diseases of Cattle). By Dr. E. Weber, Professor and Director of the Ambulatory Clinic in the University of Leipzig. Berlin : Richard Schoetz, Wilhelmstrasse 10, 1927. Pp. 370, 52 figs, 3 coloured plates. Price : Paper backs, 18 marks ; bound, 21 marks.

This book has been written from the experiences gained by Dr. Weber in treating the diseases of cattle since 1899 and from his observations in

the University Clinic. It cannot, therefore, be declared that he has been too hasty in appearing in print on the subject, and the volume bears the stamp of matured judgment and reasoning on bovine ailments. There are 34 chapters divided into sections in the volume dealing comprehensively with the ailments of the different organs of cattle that we meet with in practice. Each section indicates how the veterinary surgeon should think around the case he has in hand in order to do the best for his patient and client. The doctor divides up his subject in each section under headings like these : 1, Occurrence ; 2, Aetiology ; 3, Pathogenesis ; 4, Symptoms ; 5, Course ; 6, Diagnosis ; 7, Differential Diagnosis ; 8, Prognosis ; 9, Therapy ; 10, Prophylaxis ; 11, Legal Aspect. The writing on each of such matters is short and concise and yet quite sufficiently explanatory.

The diseases of the stomachs in cattle, foreign bodies in the stomachs, and mammitis are very fully discussed. We looked with hope for a new and regularly successful treatment of inflammation of the udder, but the fact that eight or nine different chemical solutions are mentioned as beneficial if injected or infused into the udder seems to prove to us that the treatment of streptococcal mammitis is still in the experimental stage. It will be a glad day for the veterinary surgeon and cattle owner when treatment of this affection becomes more hopeful and effective, or when measures to prevent mammitis arising become more generally known and practised. The copious bibliography in the book is a praiseworthy feature and shows what patient research Dr. Weber has undertaken in compiling his work. The difference in appearance between granulous vaginitis and coital exanthema is exceedingly well illustrated in the third coloured plate.

Parasitologie Veterinaire — Parasites et Maladies Parasitaires des Animaux. By G. MAROTEL, Doctor of Veterinary Medicine, Licentiate of Science, Professor at the Veterinary School of Lyons. Paris : Baillière et Fils, 1927. Pp. 500, 302 figs. Price 36 francs.

THIS is one of the volumes in the Cadéac Encyclopædia. It is a useful little book for students and practitioners. The classifications and nomenclature of the parasites have been simplified. Their pathogenic rôle is explained and determined, and the symptoms they set up in the host are described. Prophylaxis and practical methods of getting rid of them are discussed. The work is not only interesting to veterinarians, but, from the point of view of comparative pathology, to doctors of human medicine also.

The animal parasites contagious to human beings are clearly specified, and colonial veterinary surgeons will appreciate the lines on filariosis, trypanosomiasis, sperochetosis, piroplasmosis, sporotrichosis, etc., and the references to the part played by muscidæ, tabanidæ, etc., in the spread of disease.

Science in the matter of parasitology is continually changing and expanding, so that by the time a book gets published new facts have been noted and new discoveries made, but as far as we can see this little book is well up to date and can be thoroughly recommended as a concise and succinct treatise on animal parasitology.

Prophylaxis as regards *coccidia* in cattle may be interesting. The author recommends : isolation of the ailing animal in dry quarters (on

a meadow or in stalls), feeding on dry food ; disinfect the excrements, dung and surroundings dry and sterilize contaminated pasture (drainage, limeing, sulphates, etc.).

Tierheilhunde und Tierzucht. Eine Enzyklopadie der praktischen Nutzierkunde. Edited by DR. VALENTIN STANG and DR. DAVID WIRTH. Volume II. Publishers: Urban and Schwarzenberg, Berlin and Vienna. Pp. 765. Price RM. 40.

VOLUME II of this very efficient encyclopædia of Veterinary Medicine and Animal Breeding has not belied the brilliant promise of the previous volume, and we heartily compliment our German colleagues, Drs. Stang and Wirth, on their achievement.

The present volume commencing with Augenuntersuchung (Ophthalmology) and extending to Degenerationen (Degeneration) is a very fine product of mental and manual labour working towards a lofty ideal. We include manual labour in this statement because the printer and the binder seem to have realised that they were handling a fine piece of work, and so performed their share in its production with zeal.

Within its province, this volume deals fairly exhaustively with subjects the initial letters of which come within the portion of the alphabet dealt with. Even the beekeeper and the biometrician are not "turned empty away."

It is pleasing to note a very full reference list at the end of each article. The coloured illustrations are deserving of the highest praise.

We have only one regret in connection with this work—that it is written in German and therefore, in this country, submits itself to a very limited number of the profession. We trust, however, that in the hands of the young veterinary student it will serve as an incentive to the mastering of the German language and the opening unto himself of a storehouse of very superior information.

Correspondence

THE TRANSPORT OF CLEAN MILK.

To the Editor of THE VETERINARY JOURNAL.

SIR,—

May I be allowed to correct a statement by Mr. H. W. Steele Bodger which appears on page 262 of the interesting Clean Milk number of THE VETERINARY JOURNAL for May.

Mr. Bodger says that if the glass-lined tanks used by my company for the transport of milk to London were provided with a brine jacket, the milk could be retained at a temperature of 45° F., and its keeping properties vastly increased. It will, I think, interest your readers to know that milk transported even in an uninsulated glass-lined tank does not rise in temperature more than 1° per hour on the road. The majority of our fleet of tankers, however, are insulated with two inches of cork—the brine jacket being impracticable on moving vehicles—and in these cases the temperature of the milk does not increase by more than 1° on a maximum journey of seven hours. Milk transported by this up-to-date

method is delivered at our depots at a uniform temperature of not more than 42° F.

Yours faithfully,

J. H. MAGGS,
Chairman.

United Dairies Co.,
London, W.2.
May 24th, 1927.

Notices

R.A.V.C. ANNUAL DINNER.

THE Annual Dinner of Officers of the Royal Army Veterinary Corps, past and present, will be held at the Hotel Cecil, on Friday, June 17th, 1927, at 8 p.m.

Gentlemen desirous of attending should inform the Honorary Secretary, R.A.V.C. Dinner, War Office, Whitehall, London, S.W.1.

THE CHAMPIONSHIP DOG SHOW IN AID OF THE REBUILDING FUND OF THE ROYAL VETERINARY COLLEGE, LONDON.

HER Royal Highness Princess Mary, Viscountess Lascelles, has graciously consented to attend the Dog Show to be held in aid of the College Rebuilding Fund for the purpose of presenting the Championship Prizes.

ROYAL COLLEGE OF VETERINARY SURGEONS. ANNUAL DINNER.

THE Annual Dinner of the College will be held at the Hotel Victoria, Northumberland Avenue, London, W.C., on Wednesday, June 29th, 1927, at 7.30 p.m.

There will be a reception by the President (Lt.-Col. J. W. Brittlebank) at 7 p.m.

A number of influential guests have been invited to attend, and it is earnestly hoped that a large number of Members of the Profession will be present to support the President and Council.

The price of tickets is 12/6 each, exclusive of wines. Applications, accompanied in all cases by remittance, should be made to the undersigned, and members are requested to give on the attached form full particulars of the names of the persons for whom tickets are required.

In the absence of any special directions as to seats the Dinner Committee will allot seats to the best of their ability. To enable the Table Plan to be prepared, applications for tickets must be received not later than Saturday, June 25th.

As this is an official Dinner the invitation is limited to members of the College and their men guests.

Decorations will be worn.

FRED BULLOCK,
Secretary.

10, Red Lion Square,
London, W.C.1.
May, 1927.

ROYAL VETERINARY COLLEGE REBUILDING FUND.

AMONGST the recent donations to the College Rebuilding Fund we observe the following :—

His Majesty the King, £105.
H.R.H. the Prince of Wales, £52 10s. 0d.
H.R.H. the Duke of Connaught, £26 5s. 0d.

INTERNATIONAL HORSE SHOW.

SEVEN NATIONS TO COMPETE FOR THE KING'S CUP. NEW JUMPS FOR HUNTERS.

UNDER the patronage of H.M. The King, the sixteenth International Horse Show will be held at Olympia, London, from June 16th to 25th. The entries in the various classes are so numerous that there will be three sessions every day with competitive international jumping at each afternoon and evening performance.

The royal gala performance will take place on Monday afternoon, June 20th, when officers representing the armies of Belgium, France, Great Britain, Holland, the Irish Free State, Italy and Sweden will jump round the course for the King George V Gold Cup, at present held by the United States of America. The foreign officers are bringing with them 78 specially trained horses.

The Prince of Wales' Cup will be jumped for by three officers from each nation on Thursday afternoon, June 23rd. This most exciting event was last year won by the British Army and many officers and horses are preparing to defend the title, and they are much encouraged by the fact that the first team of jumpers ever sent out of this country by the War Office has won the Cup of the Nations at Nice, the Continent's premier award.

The International Horse Show box office is open at 12, Hanover Square, W.

CORRECTION.

(COLONEL REID'S NEW ZEALAND ARTICLE.)

On page 248 of the May issue, and in the first paragraph, the date " 1905 " should read " 1925."

Publishers' Notices

All communications should be addressed to 7 & 8, Henrietta Street, Covent Garden, London, W.C.2. Telephone: Gerrard 4646. Telegrams: " Baillière, Rand, London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editor.

Copy of advertisements should be in the hands of the publishers—Baillière, Tindall and Cox—not later than the 25th of the month, or if proof is required, not later than 23rd.

Binding Cases for Volume 82 and any other previous volumes can be obtained from the publishers. Price 2s. 9d. post free.

Annual Subscription, 21s. ($5.00 U.S.A. currency) **post free.**